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PRESENTATION OF SPECIMENS OF SPIROCHETA BELIEVED TO BE PATHOGENIC TO MAN, CAUSING FEVER AND BRONCHITIS WITH THIN MUCOID EXPECTORATION.

By H. G. WATERS, M.R.C.S., L.R.C.P.

(*Friday, February* 19, 1909.)

I am not here this evening with any idea of delivering a lecture on spirochetes, for I quite appreciate the fact that there are many present who know very much more about the subject than I am ever likely to do.

My reason for putting these specimens of a spirocheta before you is that during my work in India I came across it while examining for tubercle bacilli, and following up the case I was led to believe that it was probably the cause of a distinct type of fever associated with bronchitis. The story of the find is this: In January, 1907, a European guard of the East Indian Railway was sent to me from Delhi as a case of malarial cachexia requiring hospital treatment. He was admitted into the East Indian Railway Hospital at Tundla, and was seen by me the following morning.

He was anæmic, very weak, with no definite enlargement of the spleen, and had a temperature of 104° F. His blood was examined for malarial parasites with a negative result. On the second or third day I found his temperature on a four-hour chart was continuous, keeping between 102·6° and 104° F., and that he was troubled with a very irritable cough, bringing up a lot of thin watery expectoration.

His chest was examined with a negative result, except for a few rhonchi, and his sputum was stained for tubercle

bacilli. In the smears I found no tubercle bacilli, but a large number of spirochetes.

Teaching some of my hospital assistants, I pointed out that these were found in many mouths, particularly in those with decayed teeth, dirty gums, &c. But I examined this patient's mouth and found that he had no decayed teeth, his mouth was well kept, and I failed to demonstrate any spirochetes, on or between the teeth, nor on swabs from the buccal cavity and throat, yet there were plenty of them to be found in the mucoid matter he was expectorating.

The fever continued for about fifteen days, and during the whole of the time spirochetes were found in the sputum, disappearing when the temperature fell to normal. The patient was discharged to work at his own request, although still rather weak.

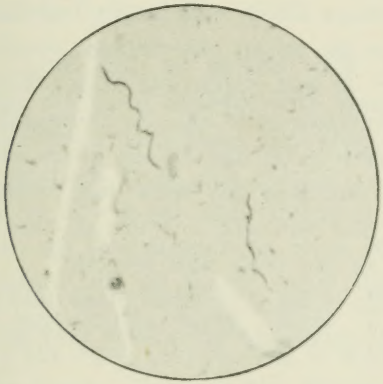
About fourteen days later he again reported sick and was admitted into hospital, with the same type of illness, fever, cough and expectoration, the spirochetes being again present in the sputum. This second attack or relapse only lasted four or five days. He has remained well since, except for an attack of benign tertian malaria in December, 1907.

Having by chance found this case, I made a search amongst the native out-patients for a similar illness, and found seven cases with the same type of spirocheta in the sputum, accompanied by fever and cough; none were taken as in-patients. Before the end of the month all these were well, and I found no more in the winter of 1907, nor again last winter, 1908, did I come across any cases of this disease.

In April, 1908, I was laid up with enteric fever and sent home on sick leave, which has put a stop to all chance of my making further investigation, and, coming

home ill, I was also unable to bring with me the charts, notes and specimens I had collected, which were packed up and cannot be got at until I return to India.

One of my assistants has sent me some of the slides which were at the hospital—these I am showing here to-night—and I am hoping that, by bringing this discovery to the notice of the profession, especially to those members who are working in India, I shall put others on the track of another of the many unexplained fevers of the Tropics.



In the *Daily Telegraph*, November 24, 1908, I notice a Reuter's telegram from Lahore, saying that "malaria continues to spread with deadly effect in the Punjab, being worse at Amritsar, where 100 deaths occur daily. The Conservancy there is at a standstill, the scavengers are smitten with the disease, trade is suspended, factories are undermanned, the bazaars are silent, and the streets are deserted, except for the passing of funeral processions. Hundreds of families have lost their wage-earners, and thousands of parents have been rendered childless. The whole city is in mourning." And I think it possible that

this spirocheta fever may be the cause. For malaria in the native is very frequently treated without the microscope, and any type of fever goes by this name.

One of my friends writes to say: "We have had an outbreak of your spirocheta bronchitis, or what I think is the same thing as we had last year." And the Locomotive Superintendent, in a letter dated December 25, 1908, writes: "We had a fearfully rough time with fever. I had no men at work and it was well-nigh slave driving. Fancy Tundla shed with 250 odd men off, including twenty-six drivers and seventy-five firemen! The engines were filthy, and hardly had coal enough on the tenders to go to an out-station; coupled with this was bad coal. It was impossible to get trucks unloaded, and the demurrage bills ran to thousands of rupees. Labour was not to be had at any price, and to harvest the crops six annas a day were paid with one-third of the yield to the workers! With all this I am barely straight yet, as the fever still lingers."

Now, Tundla is not a malarial place, and I am inclined to think that spirocheta bronchitis may account for this fever.

Discussion.

Dr. C. W. Daniels said that the only point of special importance in connection with the paper was the occurrence of a series of cases in which spirochetes had been found in the sputum of bronchial patients. It was not, he thought, an uncommon thing to find spirochetes in sputum expectorated; on the other hand, discharges from the rectum were so often found to contain a large number of spirochetes that he was doubtful of their pathogenic import. So far from associating the presence

of spirochetes with a definite type of disease, he (Dr. Daniels) had never associated it with any one special disease, and, to put the matter plainly, one was still rather doubtful of the pathogenic importance of spirochetes. He had seen spirochetes from the nose and from the great toe of the same patient and they appeared indistinguishable. Perhaps for this reason one was inclined to consider spirochetes as rather accidental parasites. After having heard Mr. Waters's paper he would be less inclined to consider them in this light, and he would look out for their definite association with a special condition.

Dr. G. C. Low said he agreed with Dr. Daniels's view. He had also seen sputum with many spirochetes in it, but had always considered that they were present accidentally, perhaps from the mouth. In bronchitis, which might be due to so many different organisms, it was difficult to say that spirochetes were the pathogenic agent. One could not, of course, grow spirochetes, and that was an unfortunate thing. Even if the parasite were found in the lung *post mortem*, it would not prove that it was the agent. Perhaps Mr. Waters might have looked for other organisms such as the pneumococcus? Medical men were just on the threshold of the study of spirochetes, and it might be found that they were responsible for more diseases than were thought of at present. He thought the series of cases mentioned by Dr. Waters in which such organisms had been seen was distinctly important, however.

Mr. Waters, in reply, said his first thought when he found spirochetes in the sputum was to regard them as an accidental contamination from the mouth, and it was only in order to demonstrate this view for the purpose

of teaching that led him to examine this particular mouth with great care. He had had in mind particular spirochetes which on two occasions he had dug out of decayed teeth. He was, however, unable to get any from this mouth. A curious thing about this case was that the patient had quite a definite illness of a duration of over fifteen days, with a subsequent definite relapse and complete disappearance of spirochetes between. There were no pneumococci isolated and grown. There were all sorts of the usual bacteria in the sputum, but there were distinctly a great number of spirochetes present in all the expectoration from day to day, and when the fever dropped they disappeared. In the second attack they were also present in large numbers, and they again disappeared in the same way.

TROPICAL NOTES FROM BARBADOS.

By T. F. MACDONALD, M.B., C.M.

The island of Barbados has the name of being quite the healthiest island in the West Indies, and even some of its medical men say that there are practically no tropical diseases there, and that, therefore, there is no reason for special study in this direction. Very little acquaintance, however, with Barbados is sufficient to prove that there is urgent demand for very special investigation into the disease question.

At the present moment a most interesting phase of things obtains, and no wonder that the ordinary medical intelligence is puzzled, and that there is much difference of opinion among general practitioners of Barbados as to the existence or non-existence of yellow fever in the island. Confusion arises from the fact that yellow fever, endemic jaundice, influenza, and cases of unclassified jaundice are all to be found at the present time here and there on the island, and, to confuse matters still more, typhoid fever, ankylostomiasis and pellagra are prevalent.

There is the open question as to whether pellagra is pellagra or sprue; the latest report of Mr. C. J. Manning calling it "psilosis pigmentosa." I shall be able to send home some specimens which will, I hope, clear up the doubt, since the disease is quite unmistakably pellagra.

All the recognized symptoms of pellagra are present: Pigmentation of elbows, knuckles, knees, breast and brow; roughness of skin, especially at the elbows and knees; history; insidious development among the poor, who consume a varying quantity of corn. Then there

are the dementia and other mental symptoms and recurrence of the disease after partial cure—complicated with typhoid, sprue and ankylostomiasis, so that puzzling symptoms are sometimes presented to the eye unpractised in tropical work.

Dr. Alleyne, of the hospital, has kindly given me permission to study the disease in the building set apart for these patients, and Dr. Wise, of Demerara, has kindly undertaken to do the microscopical work of specimens sent him, so that, between us, something definite should be forthcoming.

However great the difference of opinion as to pellagra, it is still greater as to yellow fever. One practitioner on the island may have one or two fatal typical cases of yellow fever, with all the symptoms of acute fever, black vomit, and slow pulse, and so naturally diagnoses the dreaded epidemic. Another may have typical cases of epidemic jaundice, non-fatal and varying in severity, and he naturally declares against yellow fever. Then, again, cases of well-marked gastric influenza occasionally prove fatal, and some of them have jaundice ; these cases are diagnosed correctly as influenza. The mistake is evidently being made of generalizing from one set of cases to another.

I have seen four cases of jaundice in Barbados, one from yellow fever, one from epidemic jaundice, one from influenza, and one from apparently simple obstruction of the bile-duct, and I can quite sympathize with those who have never seen an epidemic of jaundice, such as I reported in the *Australasian Medical Gazette* in 1887, as having occurred in New South Wales. Of course, I cannot say how much yellow fever there is in Barbados, but I hope I have said enough to prove the point that expert investigation into the tropical diseases of Barbados is much needed.

Discussion.

Dr. Low said he knew Barbados well some little time ago, and he did not think there was any doubt as to the cases mentioned by Dr. Macdonald being pellagra. They were certainly not sprue. As to yellow fever, he thought it was always difficult in West Indian islands to say that yellow fever had started. There certainly were some peculiar cases. People who died with jaundice might not be reported as yellow fever, though they were suspicious cases. Of course, it meant so much to an island if yellow fever were reported to have broken out, that medical men have to be excessively careful in their diagnosis. He had never heard of epidemic jaundice in the West Indies, but he had heard of obstructive jaundice giving rise to difficulty in diagnosis. If *post-mortem* examinations were made of cases it might help to clear up the diagnosis to a considerable extent, because of the typical black vomit in the stomach of yellow fever corpses and the typical condition of the liver. In islands where there was much malaria it was exceedingly difficult, in some of the cases which occurred, to say whether it was yellow fever or malignant malaria. Therefore he thought it was highly important that someone with knowledge should decide the point.

THE EXTINCTION OF YELLOW FEVER IN THE STATE OF SÃO PAULO (BRAZIL), AND IN THE CITY OF RIO DE JANEIRO.

By EMILIO RIBAS, M.D.
Director of the Sanitary Department of São Paulo.

Supposing a study of yellow fever to be still of some interest with a view to its specific prophylaxy, in accordance with the most recent scientific investigations, I desire, before speaking of the extinction of this malady in the State of São Paulo, to refer to some experimental studies made over there.

Ever since Drs. Reed, Caroll, Agramonte and Lazear, and later, Guiteras, inspired by the long observations of Finlay, made the first experiments in Cuba on the transmission of the yellow fever by the *Stegomyia fasciata*, I have been convinced of the scientific accuracy of their methods and of the truth of their deductions. I was helped in arriving at this conviction by bearing in mind what had been proved by Sir Patrick Manson in his experiments conducted in London on the propagation of malaria by the anopheles.

Meanwhile, some observers presented as a possible source of error in the conclusions drawn from the studies made in Cuba, the possibility of other means of infection than the *Stegomyia*, seeing that Havana had for many years been a yellow fever infected centre; they likewise attributed the great improvement in the public health of that city, not to the extermination of mosquitoes, but to measures of disinfection, and principally to the sanitary works which had been carried out during the North American occupation. For this reason I considered it

would be useful to repeat the Havana experiments in the city of São Paulo, which was at that time, and had been for some years, exempt from any yellow fever epidemic. I resolved at the same time to make an active campaign against the *S. fasciata*, as the only effective prophylactic measure against the spread of the disease.

Observing every care, in order to prevent any doubt, I obtained mosquitoes from larvæ caught in the town of Itu, which was exempt from this malady, and I sent them immediately to S. Simão, 365 kilometres from S. Paulo, where they were made to bite persons attacked by yellow fever.

Sixteen days later these mosquitoes were made to bite six persons in the city of S. Paulo. Dr. Adolpho Lutz, Mr. Oscar Moreira, and I myself were bitten by these mosquitoes which had sucked blood from severe cases of yellow fever, but we showed no symptoms of yellow fever.

This negative result is probably explained by an immunity obtained by Dr. Lutz and myself from frequent contact with yellow fever in epidemic centres. Mr. Oscar Moreira is a native of Rio de Janeiro, and lived for eight years in Santos, and in both these cities yellow fever epidemics had been prevalent for many years. But the three other persons who were bitten lived in places where yellow fever had never appeared nor had they been in any epidemic centres. They presented the symptoms of yellow fever.

The most interesting case belonging to this second category was that of Fiori[1]; an Italian by birth, who had lived for some years in places in São Paulo where

[1] The names of the other two who voluntarily submitted to be bitten by infected mosquitoes are Domingos Vaz and André Ramos.

yellow fever had never appeared. The disease manifested itself in him three days after being bitten by infected mosquitoes. He presented the well-known symptoms of yellow fever—high temperature, hæmorrhage, albuminuria, and jaundice.

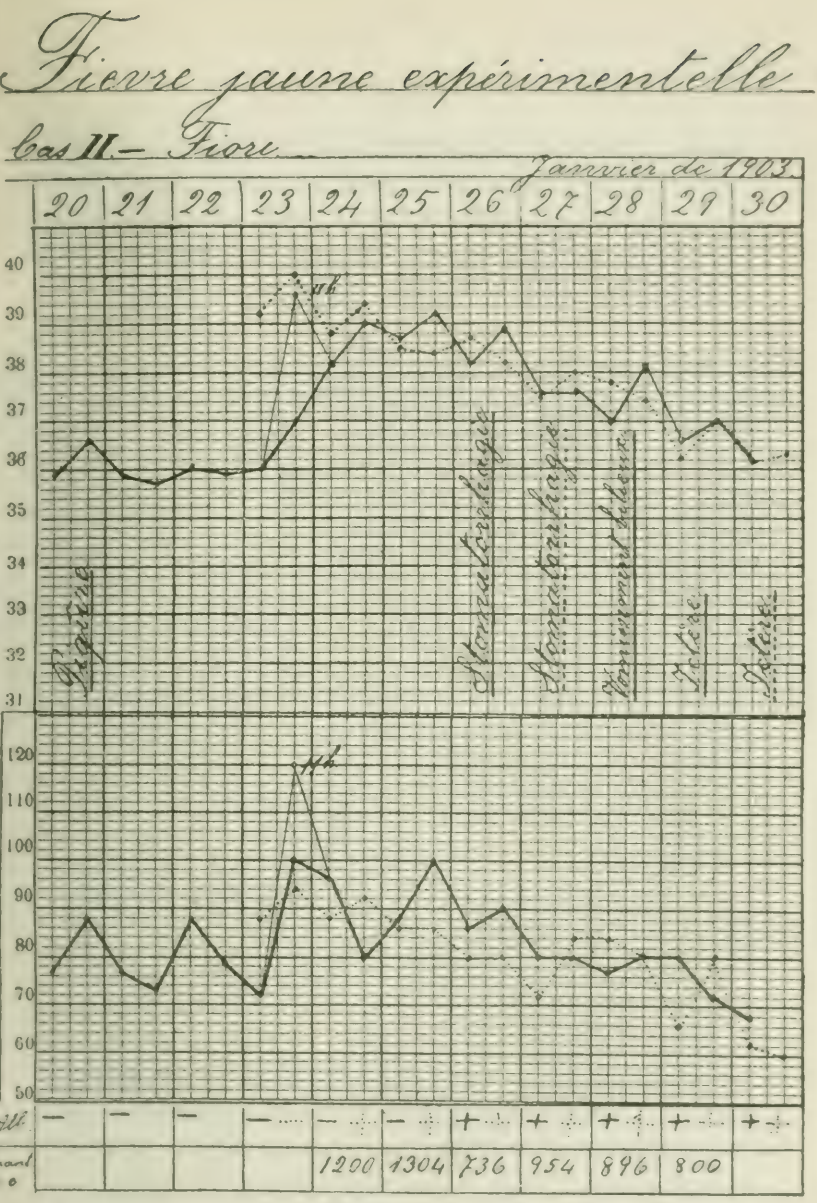
Doctors Pereira Barreto, Adriano de Barros, and Silva Rodrigues, who had had great experience in the differential diagnosis of yellow fever, gave it as their opinion that all three were cases of that disease.

The mosquitoes which were allowed to bite Fiori had already bitten Tarquinio, who was at the time suffering from typical yellow fever in the town of Sao Simão, where an epidemic was raging, and I will now show you on the screen the clinical records of these two men, the dotted lines referring to Tarquinio, and the continuous line to Fiori.

That the infection is not conveyed through clothes and other fomites in contact with the patient was demonstrated by the observations made on Malagutti Giuseppe, Angelo Paroletti, and Simsoalchi Giovani, who being non-immunes and recently arrived from Italy, slept for ten nights at the Isolation Hospital of S. Paulo in beds the linen of which was purposely contaminated by "black vomit" and the dejecta of persons suffering from yellow fever, without presenting any alteration from the normal condition.

In Rio de Janeiro, Marchoux, Simon, and Salimbeni, who were sent by the Pasteur Institute of Paris to study yellow fever, also confirmed by experiments the transmission of yellow fever by the *Stegomyia fasciata*, and in their experiments put forward other interesting details on the subject.

Proceeding now to give you an idea of the epidemic course of this disease in the State of S. Paulo during the



Cas produit par la piqûre des moustiques infectés

Cas primitif ayant servi pour l'infection des moustiques – J. Tarquinio –

DIAGRAM 1.

time that I have been able to gather statistics, I now show you a diagram referring to Santos, a city of 60,000 inhabitants, of great commercial importance, as it is the only port through which the great import and export traffic is carried on for the whole State of S. Paulo.

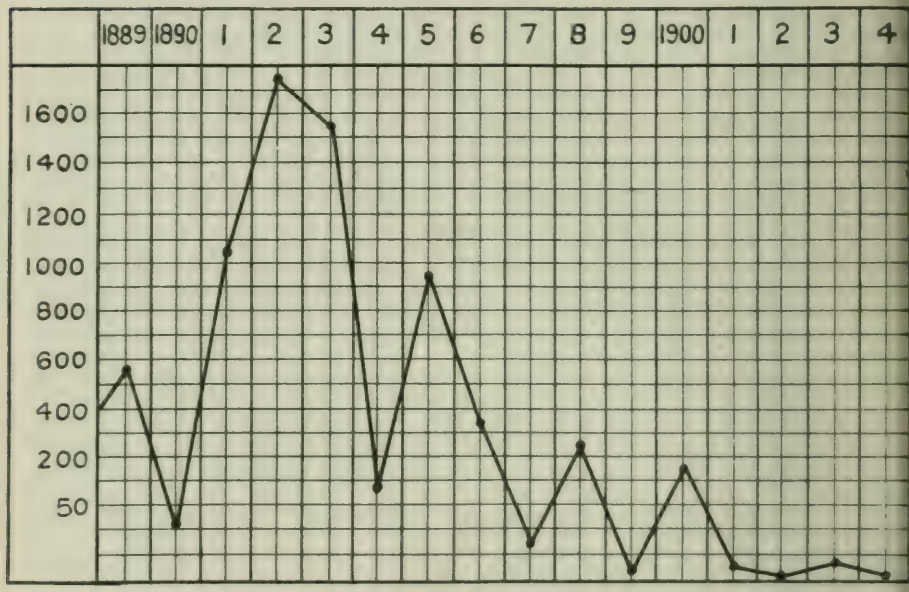


DIAGRAM 2.—SANTOS.
Diagramme de la mortalité de la fièvre jaune pendant 16 ans.

You will see from the diagram that there has been no epidemic in Santos since 1900, and we have thus good reason for believing that yellow fever has been exterminated from a city where it was endemic for over half a century.

From 1901 to 1904 sporadic cases were of rare occurrence, and from 1905 up to 1908 no case of that disease was notified among the inhabitants, and the most rigorous domiciliary visiting failed to discover a single case.

Our campaign against mosquitoes was systematically undertaken in 1903. But it must be noted that for a few years before this date extensive works had been carried out in Santos for improving the general sanitary conditions of the city. These works consisted mainly in closing wells, draining ditches of stagnant water, deep drainage of the soil, straightening the courses of streams, and the great enterprise of constructing the magnificent docks. Without any idea of the *rôle* played by the *Stegomyia* in propagating yellow fever, these extensive works were most effectual in destroying the great breeding places of these insects. In addition, the rigorous removal of rubbish put in force from 1898, aided in greatly diminishing the number of mosquitoes. Broken bottles, old tins, and other receptacles containing stagnant water, as is well known, are very suitable places for breeding mosquitoes, and these are found in enormous quantities in the rubbish of any city.

I now call your attention to the diagram of Campinas, which was the second city to be seriously attacked by yellow fever in the State of S. Paulo.

Yellow fever has not been epidemic in Campinas since 1898; in 1903 there were notified twenty cases, with nine deaths, nearly all imported from Casa Branca, a town connected with Campinas by railway, and where a slight epidemic broke out. The reasons given for the disappearance of yellow fever in Santos are applicable to Campinas, where the same measures were put in force, but being an inland town there were no dock works.

In regard to the prophylaxis of yellow fever the two inland towns of Sorocaba and Ribeirão Preto present some points of interest.

In Sorocaba, a town of about 15,000 inhabitants, 2,322 cases of yellow fever were notified in 1900, but in 1901

there was not a single case, nor has there been one since. This sudden disappearance from one year to another is unique in the history of the epidemics in all the other towns of S. Paulo, and the explanation is that in that year for the first time there was put into practice the rigorous extermination of mosquitoes.

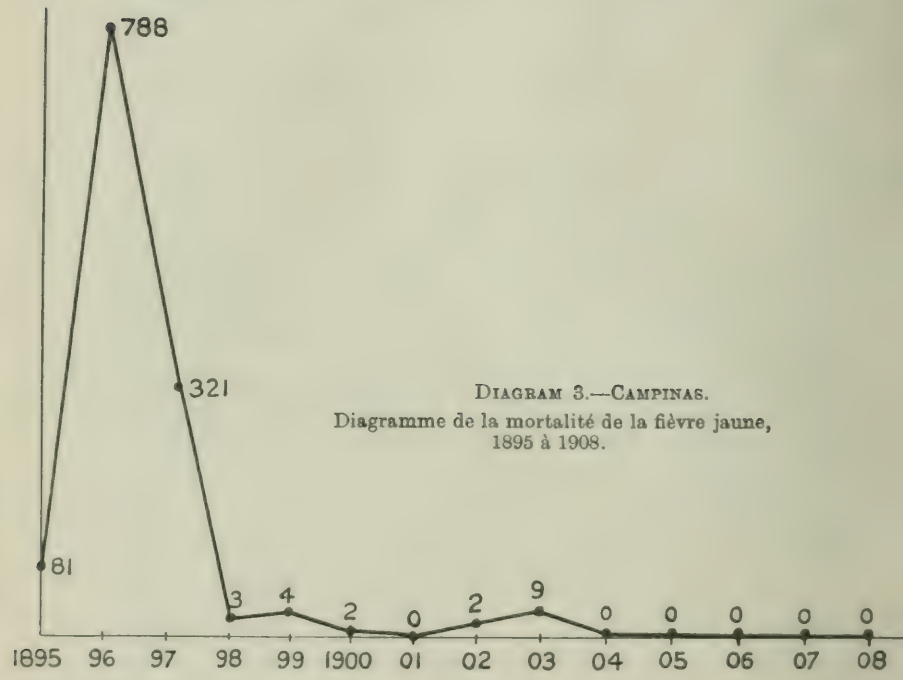


DIAGRAM 3.—CAMPINAS.
Diagramme de la mortalité de la fièvre jaune, 1895 à 1908.

At Ribeirão Preto, a town of the same size as Sorocaba, 810 yellow fever cases were notified in 1903. Since that year there has been no further outbreak of the disease, and I consider this proves the fact of the *Stegomyia* being the active propagating agent more clearly even than in Havana, because in Ribeirão Preto no new public works were undertaken.

Ribeirão Preto has enjoyed this immunity in spite of the fact that its population is largely composed of immigrants, arriving from Italy for work in this great centre of coffee agriculture, who must be considered non-immunes.

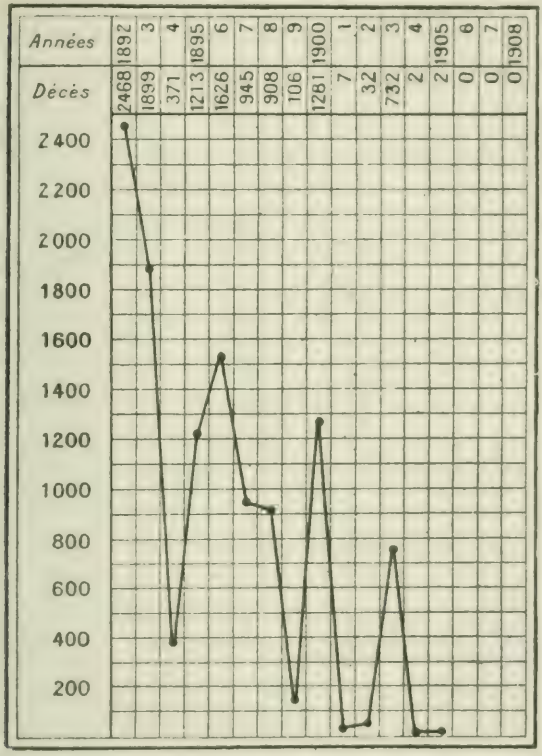


DIAGRAM 4.—ESTADO DE S. PAULO.
Diagramme de la mortalité par fièvre jaune dans tout l'Etat (1892-1908).

The only measure taken was the destruction of mosquitoes, and I purposely abstained entirely from disinfection of houses, clothes or other objects which

had been in contact with yellow fever patients. The case of Ribeirão Preto has in Brazil contributed much to dispel the remaining doubt as to the mode of propagation of the disease.

Finally, the last diagram indicates that the whole State of S. Paulo has been quite free from yellow fever for fully five years. The last epidemic manifestation was in 1903, and, as in the case of Ribeirão Preto above referred to, so in all the other affected places, the only measures employed for prophylactic purposes were the extermination of mosquitoes by destruction of their breeding places. This was carried out by specially organized gangs of men who were instructed in the methods to be employed in seeking out and destroying these breeding places.

In some places the presence of *Stegomyia fasciata* was reported before any cases of yellow fever appeared. In these cases the same measures were adopted, with the result that no epidemic appeared, and owing to proximity to epidemic centres it was reasonable to apprehend that they could not escape the scourge.

Therefore, with regard to the State of S. Paulo, we may say that yellow fever finally disappeared since the measures for extermination of *Stegomyia fasciata* were systematically carried out.

In concluding my communication, I must add that in the capital of Brazil, the beautiful city of Rio de Janeiro, having nearly one million inhabitants, a great commercial centre, and possessing one of the finest and largest ports in the world, the struggle against yellow fever has also been rewarded with enormous success.

This splendid result is due entirely to the great energy and ability put into practice by Dr. Oswald Cruz, who, I consider, in all matters of hygiene and public health,

is second to none in Brazil, and possibly in all South America.

Dr. Cruz, surmounting all difficulties, has succeeded in stamping out yellow fever in the great city of Rio, relying for that purpose on the extermination of mosquitoes. Under the exclusive supervision of my colleague, a service has been organized in Rio de Janeiro which may be considered as a model.

I have pleasure in communicating to this illustrious Society that yellow fever is no longer a disease to be dreaded in the two most important ports of Brazil, Rio de Janeiro and Santos, and I am much obliged to you for the opportunity afforded me of reading this paper.

Discussion.

Dr. W. L. Strain said that Dr. Ribas's paper was presented with the object of proving that the mosquito is the one and only means of propagation of yellow fever. He (Dr. Strain) was in São Paulo many years before the mosquito was generally thought of as playing any part in the propagation of yellow fever. He had passed through, and had had much to do with, the most terrible epidemics of yellow fever that had probably afflicted the port of Santos. As had been stated, it was a very important port, being the only entrance to a vast territory of agricultural land, and in 1889-92 there was such a mortality in that city that at times it seemed as if there were not enough living to bury the dead. He did not think one yet realized the important part played by the mosquito. When the experiments in Havana were made known to the world, São Paulo was one of the first places to confirm the notable experiments in

Havana. In a series of experiments carried out in São Paulo, Dr. Ribas had voluntarily submitted himself, together with two other medical men, to be bitten by mosquitoes which sixteen days previously had bitten a severe case of yellow fever. These three remained unaffected. Three others who were non-immune—Italian immigrants who had lived in districts where yellow fever had never been prevalent—were bitten by the same mosquitoes, and contracted yellow fever. All the usual symptoms were present—high temperature, hæmorrhage, albuminuria, and jaundice, or yellow discoloration. Since that time São Paulo had put into force, under the direction of Dr. Ribas, a vigorous campaign against mosquitoes, and certainly there was every reason for it, as, apart from *Stegomyia fasciata*, mosquitoes were a terrible nuisance, especially in the hot season. To this active campaign, and to the extensive works of sanitation which had been carried out in the port of Santos (without, however, any idea of attacking the breeding grounds of the mosquito, but simply for the general and much needed sanitation of the city), could be attributed the absolute immunity of Santos from yellow fever for nearly five years. It was a great pleasure to Dr. Strain to know Santos under present conditions. When he left there it was already a place to which people were going for holidays, and very different from what he knew it to be eighteen or nineteen years ago. It was a wonderful advance, and a great feat in scientific prophylactic medicine, to be able to say that cities which had once been infected with yellow fever—where thousands upon thousands had died—were now absolutely free from yellow fever.

Dr. C. W. Daniels said that the results from these prophylactic experiments were very striking. He wished

however, to point out that in British Guiana, where no serious attempts had been made to exterminate mosquitoes, almost regularly every thirteen years there was a bad outbreak of yellow fever, and between these periods there were no cases at all. He did not doubt that yellow fever was carried by *Stegomyia fasciata*, but the periodical outbreaks which he had referred to occurred in other West Indian islands. In Barbados, where some of the worst epidemics of yellow fever had occurred, there were some years of immunity and then an outbreak. He thought they had more to learn about yellow fever so long as they could not explain why it should die out when the mosquitoes were not destroyed.

Dr. C. F. Harford said he understood that three of the persons who were bitten in the experimental tests referred to by Dr. Ribas were immunes. He did not gather, however, that they had had yellow fever, but that they had only lived in yellow fever districts. Why were they immune if they had not had yellow fever?

Dr. Carnegie Brown asked how the present mortality from all causes in these ports compared with other tropical centres. For instance, could Dr. Ribas inform them as to the general death-rate in Santos and other cities of Brazil?

Dr. Ribas stated that the general mortality had diminished 50 per cent. from the time when yellow fever was prevalent.

Sir Patrick Manson said he was sure he was expressing the feelings of the Society when he told Dr. Ribas that his presence amongst them was a source of great gratification. He (Sir Patrick Manson) hoped Dr. Ribas would convey to his colleagues a message to the effect

that should any care to join or visit the Society when in London they would be extremely welcome here. He had listened with great interest to Dr. Ribas's paper and would like to ask one or two questions. Could Dr. Ribas give him any idea as to the percentage of reduction of *Stegomyia* by the anti-mosquito measures in force? He would also like to know the reason why the Creole was said to be immune. One knew why the Creole was immune against malaria; as children they were liable to mild attacks of that disease, which secured immunity when they grew up. Perhaps immunity from yellow fever could be explained on the same ground. And if the extinction of yellow fever by anti-stegomyia measures was an established fact, should we not conclude that this disease might, by and by, fall upon an entire community which had not been protected against yellow fever, so that if by accident yellow fever was introduced into some Brazilian town where these *Stegomyia* measures had been neglected, we should have a bigger epidemic than had ever been known before.

In answer to some questions, Dr. STRAIN, replying for Dr. Ribas, said that in Dr. Ribas's opinion the mosquitoes did not bite the black to the same extent that they bit the white people, although it was very difficult to explain why. He had at least never heard blacks complain of mosquitoes in the same way as the whites. Dr. Ribas thought the reason why he remained unaffected during his experiments was owing to the fact that he had been in very close contact with yellow fever for many years in various centres where epidemics prevailed and so had acquired an immunity. He could not speak authoritatively as to the immunity of British Guiana. Every year there was an enormous importation of European immigrants into the

two ports of Rio and Santos, thereby, probably, furnishing material that was at least very susceptible to infection by yellow fever. It was an undoubted fact that persons who had recently arrived in an epidemic centre were much more susceptible to the disease. They got the fever, whereas others, like Dr. Ribas, who had lived for years in contact with yellow fever, had never had the disease. He had seen immigrants go down with yellow fever in four or five hours when the disease was prevalent at Santos. Consequently, immigrants were hurried through the town in order to escape infection. Probably the difference between British Guiana, or Barbados, and Brazil, was the enormous importation of immigrants from Italy into the latter for work requiring European labour.

Sir PATRICK MANSON asked if the Creole had the same immunity against yellow fever when it first came to Rio. How were the Brazilians affected by it?

Dr. RIBAS said that in 1850, or 1851, the first great outbreak coincided with an outbreak of cholera, and apparently at that time yellow fever showed the same peculiarity as regards black races as it does to-day. The black races were not so susceptible to yellow fever as they were to the cholera. His impression was that Brazilians had no immunity because the epidemic raged amongst them while the blacks escaped.

Percy Lund, Humphries & Co. Ltd., London and Bradford
Replika, February, 1939.